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THE NATURE OF PHOTOANISOTROPY IN GELATIN AND COLLOIDAL FILMS COLORED WITH ORGANIC DYESTUFFS

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By measurements of the photodichroism and color absorption it was established that the photodichroic sensitivity of colored films depends on the type of dyestuff, the film-forming material and its quality, and on the photochemical sensitivity of the given system. The photochemical sensitivity of any dyestuff is one of the essential conditions for the stimulation of photoanisotropy.

Other factors which determine both the photodichroism sensitivity of the film and the spectral distribution of the dichroism are the nature of the film-forming material and its quality in relation to the quantity of dyestuff per unit of area.

By a study of the spectral distribution of dichroism excited by polarized white and monochromatic light, it was determined that negative dichroism (reduction of the intensity of light oscillating in the direction of electric light /longitudinal direction?/) always originates in those portions of the spectrum in which the absorption of the vector has been reduced. On the other hand, positive dichroism always appears in that portion of the spectrum in which the absorption of the vector has been increased. Consequently, discoloration (or any other photochemical change) of the dyestuff leads to the development of negative dichroism, and the formation of intermediate colored photoproducts conditions the appearance of positive dichroism.

Investigation of the photodichroic adaptation of colors established that only a few dyestuffs possess this property, and that photochemical adaptation of colors is a result of the formation of intermediate colored photoproducts which are photodichroically sensitive and which undergo further photochemical changes under the influence of polarized light.

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On the basis of the available material, the supposition is expressed that the reason for the photodichroism is the anisotropic micelles of the film-forming substance colored dichroically by means of directed addition through adsorption of ions or molecules of the dyestuff on the surface of the micelles. Since the colored anisotropic micelles in the films are oriented badly, the film appears isotropic on the whole. During the absorption of polarized light, the micelles which are oriented according to the direction of the oscillation of the electric vector of the exciting light discolor faster than the others, and in the spectral regions subject to absorption of light by the dyestuff the film becomes more transparent for oscillations of light waves taking place in that direction. Therefore, negative dichroism appears in these regions. Vice versa, in the spectral region of absorption of the photoproducts formed, if they color the micelles dichroically, the absorption of the electric vector in the direction of the oscillation is increased, so that positive dichroism appears in these particular portions of the spectrum.

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